The CONO-COLOR™ adapter is one element of the Conographic™ system, which includes a variety of complementary graphics hardware and software products for the IBM personal computer and other PCs compatible with it. All products in the Conographic system support Conography™, an advanced technology that expands the field of graphics to include conic curves.

The CONO-COLOR adapter is a greatly enhanced substitute for the IBM Color/ Graphics Adapter for the IBM PC and compatibles. CONO-COLOR features 256 colors, two character sets, various resolutions up to 640 X 400 and 512 X 512, conic curves, and 128K bytes of display memory. In addition to the advanced Conographic character and graphic modes, the CONO-COLOR adapter supports IBM-compatible character and graphic modes, allowing existing software for the IBM Color/Graphics Adapter to run without modification.

Two software modules come bundled with CONO-COLOR. These include: (1) the assembly language primitives and fundamental routines that drive the adapter hardware, and (2) the system linkages to Conography.

Color

Color display is implemented by a colormap and a palette. The palette has 16 entries, each of which can be assigned any color from the spectrum of 256. Eight bits are used in color selection, three for red, three for green, and two for blue. The palette entries can be dynamically modified by the colormap, which pairs eight-bit color values to the respective palette entries. NOTE: Use of the 256 color spectrum requires an analog RGB monitor. Digital (IRGB) monitors can only display 16 colors (8 colors at two intensity levels).

The palette selects colors for the active display screen area. The color of the border (around the active screen area) can be separately selected to any color from the 256 spectrum. The display can have 17 colors on the screen simultaneously, 16 in the active area and 1 in the border.

Palette modification (or swapping) can produce instantaneous color changes, apparent motion, and other special effects, and also simplifies the investigation of different color patterns. A drawn image can be made to disappear (or blink) simply by loading (toggling) the background color into the appropriate palette entries.

Memory Paging

The CONO-COLOR display memory can be partitioned into a number of pages in both character and graphic modes, except at the highest graphic mode resolutions (640 X 400 and 512 X 512), which require all memory for refreshing the screen. In the lower resolution graphic modes, the memory can hold two or four pages, which can be scrolled (vertically) in pairs. In character modes, the memory

can be partitioned into two sets of 5 to 16 pages per set. The pages in a set can be scrolled (vertically) for easy manipulation of multipage documents. A principal feature of the multipage capability is that while one page is being displayed, the others can be modified, facilitating animation and other special effects.

Scrolling (vertically) can be performed one text line at a time in character modes, or two pixel lines at a time in graphic modes, enabling the continuous scroll effect used in TV and movie credits.

Conographic Modes

Conographic modes offer a convenient range of user selectable options. Character modes are 40 or 80 characters per line at 36 lines per page, plus 64 characters at 51 lines, with two ROM sets of 256 characters each. Graphic mode resolutions are 320 or 640 horizontal by 200 or 400 vertical, plus 512 X 512. NOTE: For maximum viewing comfort at vertical resolutions of 400 or 512, a monitor with a slow phosphor is recommended. The 512 X 512 resolution requires a monitor capable of a non-standard scanning rate (approximately 21 KHz).

All Conographic modes make full use of the colormap spectrum of 256, allowing the user to select an on-screen palette of any 16 colors, plus any additional border color. The optional NTSC video output can also be driven in a B&W mode, which is actually a 16-level gray scale controlled by the colormap.

IBM Compatible Modes

All operating modes supported by the IBM Color/Graphics Adapter are also supported by the CONO-COLOR adapter. Once the appropriate CONO-COLOR attributes are set up, any program that runs on the IBM Color/Graphics Adapter will run on the CONO-COLOR adapter and produce the same effects with the same colors.

Enhancements to IBM Compatible Modes

Besides being fully compatible with the IBM Color/Graphics Adapter, the CONO-COLOR adapter can enhance the performance of IBM-compatible software (without modification to the software) in the following ways:

°   The two IBM graphic palettes (red/green/brown/other OR cyan/magenta/ white/other) can be replaced by a palette of any four colors out of the 256. Hence, color selections of existing software can be enhanced simply by changing the colormap.

°   In character modes, the user can increase legibility by selecting the alternative (sans-serif) set of 256 characters in place of the standard set, and/or by changing the character aspect ratio, i.e., by shortening the characters slightly while increasing the space (leading) between lines. Moreover, selection of palette colors for characters is from the spectrum of 256 (rather than from the 16 color IBM set).

°   Finally, in all modes CONO-COLOR provides more pages.

Other Hardware Features

° Fast screen erase

° Light pen interface capable of single pixel resolution

° Three individually enabled conditions that request interrupts on IBM PC channel 2 (IRQ2). Interrupting events are: vertical sync, turning on the light pen switch, and the light pen detecting a spot.

° Multiple display outputs: RGB analog, with selectable sync on green; IBM compatible IRGB digital; and optional NTSC video (full color or gray scale, with selectable phase alternation).

° Single or double pixel per byte packing/unpacking for graphics memory read/write operations.

° Double-ported display memory with data rates exceeding 14 megabytes per second.

° Wraparound panning.

SPECIFICATIONS

Operational

Color spectrum	256 colors
Color construction	Red 3, green 3, blue 2 (bits per gun)
On-screen colors	17 (16 in active area, plus border)
ROM character fonts	2 sets of 256 characters
Display memory	128K bytes (4 banks in a 32K IBM address space)
PC 8088 access	Unrestricted, even during active display
Field rate	60 Hz minimum
Refresh rate	Interlace: 2 field cycles
	Non-interlace: 1 field cycle
Fast erase	1 refresh cycle
Interrupts	3 selectable, on IRQ2
Outputs	Analog RGB, IRGB, optional NTSC video

Operating Modes

	Format	Pages	Scrollable Page-Sets	Pages/Set
Conographic				
Character	40 X 36	22	2	11
Character	80 X 36	10	2	5
Character	64 X 51	10	2	5
IBM-Compatible				
Character	40 X 25	32	2	16
Character	80 X 25	16	2	8

Enhancements: more pages, alternative character set, extra leading between lines, 16 colors selectable from a spectrum of 256.

	Active Pixels	Colors	Border Color	Pages	Comments
Conographic					
Graphic	512 X 512	16/256	1/256	1	
Graphic	640 X 400	16/256	1/256	1	
Graphic	640 X 200	16/256	1/256	2	
Graphic	320 X 400	16/256	1/256	2	
Graphic	320 X 200	16/256	1/256	2	Scrollable
Graphic	320 X 200	16/256	1/256	4	Scrollable, 2 X 2
IBM-Compatible					
Graphic	640 X 200	1/256	Black	4	Monochrome, 2 X 2
Graphic	320 X 200	4/256	Background	4	2 X 2

Enhancements: more pages and more colors.

<u>Physical</u> <u>and</u> <u>Environmental</u> -- Satisfies requirements for operation in the IBM PC and PC-XT, and uses one expansion slot.

<u>Warranty</u> -- One year on parts and labor.

BUNDLED SOFTWARE

CIOS™ (Conographic Input Output System) -- contains drivers for the adapter and assembly language graphics primitives.   CIOS also has a complement of multi color paint routines, with fill-to, fill-only, and windowing options; and routines for text insertion in graphic modes.   CIOS can handle three software character sets -- the set defined in IBM CIOS ROM, one identical to the alternative set contained in the CONO-COLOR adapter, and a user-defined set.

CURVE™ -- interlinks Conography throughout the system.   Conography expands the repertoire of graphics primitives to include conic curves, circles, arcs, and ellipses (at any orientation).

OPTIONAL SOFTWARE

HALO -- is a collection of graphic subroutine tools compatible with a wide variety of languages.   Advanced features include hatch styles, pattern fills dithering, fonts, world coordinates, animation and image compression.

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